On February 2nd, the San Francisco Public Utilities Commission (SFPUC) converted their water disinfectant from chlorine to chloramines. The SFPUC made the change to chloramine to meet current and anticipated drinking water regulations set by the US Environmental Protection Agency (EPA) to lower the levels of disinfection byproducts, primarily trihalomethanes in municipal drinking water systems. Trihalomethanes are suspected cancer-causing by-products of using chlorine as a disinfectant. This was the old disinfectant.

Since SFPUC's conversion, there has been some concern expressed regarding the chloramination of drinking water. The information below has been compiled from the SFPUC and the Alameda County Water District (ACWD).

What are chloramines?

Chloramines have been widely used as a disinfectant in drinking water in the U.S. and Europe since the 1930s. The Alameda County Water District first switched its surface water treatment plant over to chloramines in 1983. Livermore, Pleasanton, and Dublin switched to chloramines in 1990 and the East Bay Municipal Utilities District switched in 1998.

A main reason to switch is because of a class of compounds known as disinfection by-products, specifically known as trihalomethanes or THMs. As water flows down rivers and streams, it picks up naturally occurring organic matter from the leaves and soil. In the late 1970s and early 1980s, it was discovered that when some of the components in this natural organic matter came into contact with chlorine used to disinfect drinking water, they could form minute concentrations of these THMs. These minute concentrations are measured in milligrams per liter or parts per billion. As a reference, one part per billion is equivalent to one inch compared to twice the diameter of the earth.

It is suspected that if THMs are consumed in high concentrations over a lifetime, they may statistically increase the rates of some cancers. Because of this finding, the EPA began regulating THMs in the 1980s, with a maximum contaminant level (MCL) of one hundred milligrams per liter (or one hundred parts per billion). To continue meeting its commitment to water quality, SFPUC switched to chloramines. Chloramines do not form these potentially carcinogenic THMs and therefore makes the water safer for human consumption. Recently, the EPA has lowered the MCL for THMs to 80 milligrams per liter. It is due in part to chloramination that the THM levels in our distribution systems are well below these more stringent THM standards.

Chlorine and ammonia combine to form chloramine at a concentration of two to three milligrams per liter. This equates to about 1% – 1½% of a regular 200 milligram Motrin capsule. Even though chloramines are based upon a chemical combination of chlorine and ammonia, there is no ammonia in the water, just as there is no chlorine gas in table salt. It is one of the wonders of chemistry that elements can combine to form a compound that exhibits properties completely different from the parent elements. In this

particular case, ammonia and chlorine, (we inject liquid chlorine and liquid ammonia) combine to form chloramine, a completely different compound. For example, two toxic elements, sodium metal and chlorine gas combine to form table salt, a compound which is necessary for life to exist but which exhibits none of the properties of either chlorine gas or sodium metal. Similarly, an explosive gas like hydrogen combines with a gas, which promotes combustion, oxygen, to form liquid water, which exhibits properties unlike either individual element. There is no ammonia in your tap water as a result of chloramination just as there is no gaseous hydrogen in water. Some minuet amounts of Ammonia do occur naturally in water.

Health Information

Disinfectants like chlorine or chloramine are added to the water to control pathogenic organisms, which may be harmless for some animals but can be lethal for humans. It is estimated that eighty percent of the advancements made in public health are due to the fact that we have sanitary and potable water systems. In the U.S., we no longer have to endure cholera, typhus or other waterborne disease epidemics that currently kill over 10 million people each year in other countries throughout the world.

Ironically, there are signs posted all along the waterways in Yosemite National Park which warn people to not drink any natural, untreated water from any lakes, streams, or rivers due to the presence of pathogenic intestinal protozoans, such as Giardia Lambia, and Cryptosporidium. Those same waterways teem with fish, and the wilderness is full of wildlife, but the water there would make a person who drank it violently ill. We cannot exist in the fishes' environment any more than they can live in our environment. Necessarily, those environments must be adapted for the particular organism. People cannot breathe water and fish cannot breathe air. We treat the tap water so that is safe for people to drink. That is our charge. If someone wishes to put tap water to a different purpose, whether for fish or for beer for example, then it is incumbent upon them to treat it for that specific purpose.

The tap water is safe for diabetics, kidney dialysis patients, lupus erythmeatosis patients, to drink. Even though tap water is disinfected to be pathogen-free, it is not necessarily sterile. It must be recognized that individuals with severely comprised immune systems are more susceptible to opportunistic environmental bacteria. This is one of the advantages of chloramine. It does not dissipate as rapidly and may provide greater protection from environmental bacteria such as Legionella, which have been found to grow in some showerheads, cooling systems and aerators. Bacteria from food, contact or air can grow in aerator screens and filters. Staph and strep bacteria can live on the skin. While harmless to the average individual, these could be harmful for someone who was immuno-compromised. For these individuals, it is between the patient and the doctor to determine which environmental exposures are acceptable.

Some have been concerned with acid reflex (gastro-esophageal reflux disorder or GERD). This can be exacerbated by coffee, tea, and fruit juice as well as by chocolate and wine. Tap water is not harmful for this condition. There is no ammonia in the

water. It is chloramine and its concentration is insignificant compared to the quantity of hydrochloric acid, which naturally occurs in the stomach. An insufficient cardiac orifice at the base of the esophagus causes GERD. It allows the acid in the stomach to splash up onto the esophagus causing the burning sensation know as heartburn. There are a number of over-the-counter and prescription medications which can be used to limit the production of acid.

Chloramine is broken down during the digestive process. It does not enter the blood stream. This has been confirmed with the EPA's chief toxicologist for Region IX.

Similarly, the fluoride added to the drinking water to prevent dental cavities is not carried over into breast milk. There should be no problem with newborns drinking formula made with chloraminated water. Premature babies are not breast fed since they have not yet developed the ability or the strength to nurse. Most preemies are on an I.V. Later, they may be fed formula or "expressed milk" through a "gavage tube" through the nose to the stomach. However, if there was a need for absolute sterility, hospitals may use sterilized water to prepare it.

Most of the water that is used for landscape irrigation percolates into the ground. It either percolates into the underground aquifers or is lost through the plants into the air via transpiration. When typical household irrigation gradually runs off landscaping, soil and pavement the "chlorine demand" consumes the residual chlorine or chloramine, effectively neutralizing the residual before it enters the storm water drain or bay. There is no effect on estuarine or marine organisms. Before water leaves any Bay Area wastewater treatment plan, the chlorine and chloramines are neutralized as well.

Chloramine-affected Businesses

Treatment precautions for chloramine for dialysis clinics, biotech companies, fish and amphibians and businesses such as breweries, must also be taken with water that has been treated with chlorine, the previous disinfectant used by the SFPUC. Beer manufacturers must remove chlorine and chloramine because either will inhibit the growth of their yeast just as chlorine and chloramine inhibit the growth of pathogens in drinking water through disinfection.

Both chlorine and chloramine must be removed before tap water may be used in the kidney dialysis process. This is not so much to protect the patient as to protect the equipment and the membranes. The membranes used are specifically permeable to urea and other amine compounds. These compounds are removed from the blood by these membranes since the impaired kidneys of the dialysis patient cannot remove the urea and amine compounds that are naturally produced by the body. The chlorine and chloramine are removed from the feed water to prevent damage to these membranes. During dialysis, there is no direct contact between tap water and the patient's blood. Typically in these processes, activated carbon is used to remove chlorine. Catalyzed carbon is used to remove chloramine.

Dialysis treatment centers take these special precautions because they must treat chloramine water to meet very specific needs, which may require very specific treatment. The disinfectant removal methods of all of these businesses in the of San Mateo County were inspected and approved by the County's Department of Health prior to the conversion from chlorine to chloramines. (They were inspected and certified by the California Department of Health Services, Licensing and Certification Division.)

Other examples are photo labs, which need to remove chlorine, or chloramine from the water, because it may interfere with the chemicals used to develop film and may adversely impact the colors in the final print (We found that photo labs were not impacted). Aquarium owners need to remove the chlorine or chloramines from the water, not because these disinfectants enter the bloodstreams of the fish, but because they can damage the gill membranes. This damage can impair the oxygen transfer across the gill membrane and fish asphyxiate. However, if too much dechloramination solution is added to the aquarium or pond water, it may bind up all of the oxygen in the water producing the same result. It is important to carefully follow label instructions.

Chloramine Removal

Chlorine and chloramine will both eventually dissipate over time. However, simply allowing the water to sit, or boiling it is an inefficient, impractical and inconsistent means of removing either compound. In fact, one of the reasons that utilities switched to chloramine is because it is a more stable disinfectant and provides greater level of protection throughout the distribution system to prevent bacterial regrowth or contamination should a break or leak occur.

There are several efficient ways to remove chloramines. When the water is to be used for fish or amphibians, the most efficient means of removal is to use a proprietary chlorine/chloramine neutralizer. There are many such products on the market and they are readily available from most pet supply stores. A reverse osmosis system will also remove chloramine. However, there is no compelling health reason to remove it. (People who wish to remove the disinfectant for personal or aesthetic reasons can contact the National Sanitation Foundation at www.nsf.org, or call 877-867-3435 for a list of certified products.)

Bottled Water vs. Tap Water

As mentioned, the regulations and monitoring requirements are far more stringent for tap water than they are for bottle water. A large percentage of bottled water is reprocessed tap water. Typically, this reprocessing consists of some form of filtration, whether reverse-osmosis or catalyzed carbon, which would remove the chloramine.

However, that could vary by the manufacturer. It is for that reason that bottled water may cost over one thousand times the cost of tap water. If you have concerns over particular bottled water, you may request a copy of their water quality analysis. As

previously mentioned, I have included a copy of our most recent water quality report with this letter so that you may compare our water quality to bottled water.

Hospitals use tap water for consumption and for ice. Hospital staffs recognize that the municipally treated tap water in the United States is among the safest in the world.

City of Millbrae, SFPUC and Chloramines

The drinking water treated by the SFPUC is absolutely safe for the general public. The water exceeds all State and Federal primary and secondary drinking water standards as set by the EPA and CDOHS for public health and safety. Those regulations and the testing requirements are far more stringent than those required of bottled water by the Food and Drug Administration.

The City of Millbrae is committed to public outreach and customer service. In keeping with regulations set by the California Department of Health Services and the EPA, we provide customers with a Consumer Confidence Report, which includes our annual Water Quality Report. This summarizes the results of the over 70,000 analyses that were performed by the SFPUC and City of Millbrae. Our annual water quality report will be mailed to residents on April 15, 2004 and will be posted to the City's website as well.

Some have suggested that the SFPUC should go back to the "old method" of treating tap water. However, if it did, the SFPUC would no longer meet the more stringent, primary drinking water standards for the potentially carcinogenic THMs. Chloramine makes tap water safer.